

## SIGNAL LAMP REPLACEMENT, AERIAL INSPECTION, AND LOOP REPLACEMENT

**Lamp Replacement and Aerial Inspection**

This work shall consist of replacing traffic signal lamps, aerial inspection, and making minor repairs to traffic signals and flashers at the locations shown on the plans. Minor work shall include aligning signal heads and signs. These repairs may be performed at the same time as the lamp replacements.

Signalized intersections included in other contracts and agreements will not be included in the lamp replacement and inspections portion of this work. A listing of the locations which will require lamp replacement and aerial inspection is shown on the plans. This work shall be performed between \_\_\_\_\_, 20\_\_\_\_ and \_\_\_\_\_, 20\_\_\_\_.

Lenses for each type of signal indication shall be washed on both the inside and outside with an approved cleaning solution. The reflector shall be washed with the same solution. Both lens and reflector shall be wiped dry with no smears or residue remaining on the surfaces.

Lamps shall be installed such that the filament of the lamp appears to be in the shape of a U. This adjustment shall be made by means of rotating the socket.

Lenses which are semi-opaque, cracked, or include holes shall be replaced.

Visors or louvers which are missing or damaged shall be replaced. The District Traffic Engineer shall be contacted for availability of replacement visors.

Wires shall not be closed in doors. Sockets shall not be tightened into terminal strips. Lamps shall not be overtightened or undertightened.

Aligning of signal heads will not be permitted unless the appropriate set screw, nut, bolt, or screw is also tightened.

A tool appropriate for tightening shall be used for aligning signal heads, replacing lenses, replacing visors, or making adjustments.

**Loop Replacement**

The Contractor will be provided plans for loop replacement at the preconstruction conference. Such loops shall be operational after tests are performed by Department signal technicians before \_\_\_\_\_, 20\_\_\_\_.

**Traffic Control Setups**

The traffic control setups shown on the plans will be required.

**Materials**

No materials or forms other than those specified herein will be provided by the Department.

Material records in accordance with 106.01 will not be required since some materials will be supplied by the Department. Other

materials are anticipated to be relatively small in quantity or acquired in quantity purchases and are not intended for use on a specific job. in bulk purchases. The Contractor shall still use quality materials which shall be in accordance with the specifications and normally accepted industry standards. Materials may be checked by the Department and will be rejected if determined to be unsatisfactory.

#### **Schedule of Operations**

The Contractor shall notify the Engineer at least five business days prior to starting both lamp replacement and loop replacement operations.

The Contractor shall notify the Engineer daily of the intended locations of work.

The work day shall consist of eight consecutive hours between 7:00 a.m. and 5:30 p.m. A work week shall consist of 40 hours on Monday through Friday. Work outside of these hours will be permitted only when directed.

Interruptions to traffic flow will not be permitted after noon on the day before a holiday to noon on the day following the holiday.

#### **Departmental Rights**

The Department will reserve the right to enter a signalized intersection included in this work, or a controller cabinet for the purpose of inspections, modifications, or maintenance.

If the Department awards a separate contract to modernize, modify, rebuild, or remove a signal installation included in this work, the Department will reserve the right to delete all or part of such work to be performed on this contract.

#### **Maintenance of Traffic**

If the posted speed limit is above 45 mi/h, signs and flashing arrow signs will be required as shown on the plans.

Maintenance of traffic shall be in accordance with 801. Traffic control layout sheets on the plans show minimum guidelines for situations which may occur. If unusual working conditions occur, the Contractor shall provide the Engineer a proposal for the traffic control measures to be used, subject to approval.

If the Contractor finds it necessary to temporarily occupy a part of a shoulder or the traveled width of pavement and restrict traffic, the Contractor shall provide all barricades, lights, flaggers, and other protection of traffic as may be deemed necessary by the Engineer and as specified in 801.

Construction warning lights shall be in accordance with the applicable requirements of 801.14, except that type II barricades, plastic drums, or construction warning signs used only for maintaining traffic during daylight hours will not require a type B low intensity flashing warning light.

When barricades, plastic drums, or other channelization devices are used to divert traffic, the length of the taper, L, shall be determined by means of the formulas as follows:

For a speed limit of 40 mi/hr or less:

$$L = \frac{S \times S \times W}{60}$$

$$(L = \frac{S \times S \times W}{60} \times 0.3048)$$

For a speed limit of 45 mi/hr or greater:

$$L = S \times W$$

$$(L = S \times W \times 0.3048)$$

where:

L = Length of the taper, ft (m)

S = Speed limit, mi/hr

W = Lateral distance traffic is being moved, ft

At locations where these devices are used to close a travel lane, the spacing in feet will be the same as the numerical value of the speed limit. (The spacing in meters of these devices shall be the same as the numerical value of the speed limit times 0.3048). When used to define the presence of a vehicle or workers temporarily occupying the traveled way, without lane closure, these devices shall be appropriately spaced to clearly outline the work area and prevent vehicles from entering the work area. A 48 in. x 48 in. (1.25 m x 1.25 m) "Workers Ahead" sign shall be placed just off the shoulder 700 to 800 ft (210 to 240 m) ahead of each operation. The signs shall be removed from view when no work operations are being conducted. Traffic control requirements not addressed herein shall be as shown on the plans. Extended work shall consist of work which takes place on the roadway for over 30 min. Short term repair activity and short term repair work shall consist of work which takes place for 30 min or less.

If a work activity involves frequent moving of the work setup, such that no work setup is in place for more than 30 min, the Engineer may require that the work being performed at an intersection, or series of intersections, be treated as an extended work zone.

When aerial work is being performed which occupies a portion of the traveled way, a minimum of one flagger will be required. The plans may show that two flaggers will be required.

All equipment which is used on or near a traveled way shall be equipped with revolving yellow warning lights. These warning lights shall be a minimum of 8 in. (200 mm) in diameter. Such lights shall be clearly visible to approaching vehicles through all phases of the equipment operation for a minimum distance of 500 ft (150 m). Strobe warning lights may be used provided that they output 2,000,000 candlepower (2 000 000 cd) during daylight hours and 1,000,000 candlepower (1 000 000 cd) during other hours.

Identification placards shall be affixed to all equipment so that police agencies and Department personnel may identify the Contractor.

The longitudinal spacing of multiple construction signs, where required, shall be 500 ft (150 m). This distance may require adjustment

based upon location conditions. All variations shall be subject to approval.

Specific traffic control requirements may arise as a result of malfunctioning traffic signals. A signal may go into flash mode during replacement of signal lamps. The Contractor shall provide traffic control, reset conflict monitors, replace fuses, and reset circuit breakers as necessary. These conditions shall also be shown on the aerial inspection reports and on the maintenance card found in the controller cabinet.

The traffic signal shall be kept cycling while lanes are closed. The Contractor shall provide a vehicle simulator in the form of a circular loop of No. 6 wire, 8 ft (2440 mm) in circumference, placed over the loop detector. If the loop is too insensitive to call the phase, the procedure as outlined below shall be used.

If the work zone occupies the detected area of an approach, the technician may temporarily place the associated phases on recall as required to accommodate reasonable traffic flow. The intersections shall be returned to their original recall settings upon completion of work. These maintenance activities shall be shown on the maintenance card found in the controller cabinet.

#### **Documentation Requirements**

The traffic signal maintenance card found in each cabinet shall be signed by the technician in charge of the lamp replacement, aerial inspection, or loop sealing operation. This record shall include the date, military time, initials and one of the following notations: Relamp, Loop Replacement, or Aerial Inspection to indicate the work performed.

The Relamp and Aerial Inspection report is shown on the plans. This report shall be used to document the work performed. Copies of this form will not be provided.

#### **Work Summary**

The Contractor shall provide a summary of the work performed each month. The reports for each month shall be provided not later than the 15th day of the following month.

The Engineer will then recommend full or partial payment. The work summary shall be an itemized listing of the date and time for intersections where work was performed and the quantity of each activity.

The work shall include the Aerial Inspection and Annual Relamp Checklist shown on the plans for those intersections where either or both of these activities were performed.

The requirements for renegotiated price for quantities in 104.02 and 109.03 will apply. However, the Contractor will not be paid a renegotiated price for pay items for which the quantities used would normally be considered an excessive overrun or excessive underrun.

#### **Signal Lamp Wattages**

The following table shall be used as a guideline for proper lamp wattages.

8 in. (200 mm) Green, 8 in. (200 mm) Yellow,	
9 in. (230 mm) Walk/Don't Walk.....	67 W
8 in. (200 mm) Red, 8 in. (200 mm) Yellow Arrow,	
8 in. (200 mm) Green Arrow.....	116 W
12 in. (300 mm) Energy Saving Grid Walk/Don't Walk.....	67 W
12 in. (300 mm) Green, 12 in. (300 mm) Yellow,	
other size Walk/Don't Walk.....	116 W
12 in. (300 mm) Red, 12 in. (300 mm) Yellow Arrow,	
12 in. (300 mm) Green Arrow.....	150 W
Optically Programmable signals, All Sizes, All Colors.....	150 W
Cabinet Convenience lamp; G, M, or P-1 Cabinets.....	67 W

#### **Lamp Requirements**

The Contractor shall provide all lamps except lamps for programmable signal heads. All lamps provided by the Contractor shall be in accordance with 922.04(b).

#### **Programmable Signal Heads**

These lamps will be provided by the Department. These lamps shall be replaced in the same manner as all other lamps. Quantities for programmable signal heads will be as shown in the Itemized Proposal.

#### **Lamp Replacement Checklist**

The following information shall be shown in the appropriate space on the form shown in Appendix B on the plans.

- (a) Date of lamp changeout
- (b) Initials of technician responsible for lamp changeout
- (c) All corrections to the plan lamp quantities
- (d) Height of lowest head per intersection on cable span systems only
- (e) Indication of whether removing a lamp at an intersection caused the signal to go into conflict
- (f) Indication of whether there is evidence of moisture intrusion into the signal heads
- (g) Indication if visors, louvers, lenses, reflectors, or balance adjusters were replaced
- (h) Indication if wiring problems exist, such as burned connections, drip loops missing, or insulation missing or damaged
- (i) Indication if quick disconnect housings still have Jones plugs which have not been removed
- (j) Indication that lamps have been installed so that the filament of the lamp appears to be in the shape of a U

#### **Method of Measurement**

Aerial inspection and lamp replacement, loop resealing, lens replacement, and visor replacement will be measured by the number of units replaced or resealed.

**Basis of Payment**

Aerial inspection and lamp replacement will be paid for at the contract unit price per each for aerial inspection and annual relamp, signal, or aerial inspection and annual relamp, flasher as the case may be. Loop resealing will be paid for at the contract unit price per each for loop, reseal. Lens replacement will be paid for at the contract unit price per each for lens replacement for the type of signal and diameter of lens shown in the Schedule of Pay Items. Visor replacement will be paid for at the contract unit price per each for visor replacement for the type of signal shown in the Schedule of Pay Items.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit Symbol</b>
Aerial Inspection and Annual Relamp, Flasher.....	EACH
Aerial Inspection and Annual Relamp, Signal.....	EACH
Lens Replacement, Pedestrian Signal, _____ in. diameter	
_____ (mm).....	EACH
diameter	
Lens Replacement, Traffic Signal, _____ in. diameter	
_____ (mm).....	EACH
diameter	
Loop, Reseal.....	EACH
Visor Replacement, Pedestrian Signal.....	EACH
Visor Replacement, Traffic Signal.....	EACH

The costs of travel time to and from an intersection and traffic control setups and devices shall be included in the costs of the pay items in this section. The cost of installation of lamps for programmable signal heads shall be included in the cost of annual inspection and relamp.